WHAT IS CLAIMED IS:

1. A method of forming a sputtering target assembly comprising a sputter target and a backing plate, the method comprising:

contacting a portion of at least one projection on a bonding side of a first assembly member having a plurality of projections, against a portion of a groove on a bonding side of a second assembly member having a plurality of grooves;

contacting a first electrode to one of said assembly members, and a second electrode to the other of said assembly members;

conducting an electric current through said electrodes to cause resistance heating of said at least one projection and said groove; and

partially deforming said at least one projection to at least partially fill said groove by applying a force between said at least one projection and said groove, thereby forming at least a mechanical bond between said assembly members.

2. The method of claim 1, wherein said assembly member having said projections is said sputter target and said assembly member having said grooves is said backing plate.

3. The method of claim 1, wherein said assembly member having said projections is said backing plate and said assembly member having said grooves is said sputter target.

4. The method of claim 1, wherein said assembly member having said grooves comprises cobalt, titanium, copper, aluminum, tantalum, niobium, nickel, molybdenum, zirconium, hafnium, gold, silver or alloys thereof.

5. The method of claim 1, wherein said assembly member having said grooves comprises tantalum or alloys thereof.

6. The method of claim 1, wherein said assembly member having said grooves comprises niobium or alloys thereof.

7. The method of claim 1, wherein said assembly member having said projections comprises cobalt, titanium, copper, aluminum, tantalum, niobium, or alloys thereof.

8. The method of claim 1, wherein said assembly member having said projections comprises a copper-chromium or copper-zinc alloy.

9. The method of claim 1, wherein said projections are of irregular shape.

10. The method of claim 1, wherein said projections are substantially cylinders, cones, truncated cones, cubes, cuboids, pyramids, obelisks, or wedges, or combinations thereof.

11. The method of claim 1, wherein said grooves are substantially in the shape of a square, rectangle, "T", "L", semicircle, truncated triangle, cusp, or a bowtie.

12. The method of claim 1, wherein said bond is formed such that a portion of the bonding side of said sputter target contacts at least a portion of the bonding side of said backing plate.

13. The method of claim 1, wherein said bond is formed such that a gap is formed between at least a portion of the bonding side of the sputter target and a portion of the bonding side of said backing plate.

14. The method of claim 1, wherein at least one groove has a shape that is different from a shape of at least one other groove.

15. The method of claim 1, wherein at least one projection has a shape that is different from a shape of at least one other projection.

16. The method of claim 1, wherein at least one groove has a volume that is

different from a volume of at least one other groove.

17. The method of claim 1, wherein at least one projection has a volume that is different from a volume of at least one other projection.

18. The method of claim 1, wherein said bond comprises an interlocking bond.

19. The method of claim 1, further comprising forming a cell member having a plurality of sides in one of said assembly members.

20. The method of claim 19, wherein at least one of said sides comprises a portion of the bonding side of said assembly member having said grooves.

21. The method of claim 19, further comprising disposing a gas in said cell member.

22. The method of claim 19, wherein said gas comprises argon.

23. The method of claim 22, wherein a pressure of said gas in said cell member is about 1 atmosphere.

24. The method of claim 1, wherein forming said sputtering target assembly is under a cover gas.

25. The method of claim 24, wherein said cover gas comprises an inert gas.

26. The method of claim 25, wherein said inert gas comprises argon.

27. The method of claim 24, wherein said cover gas is doped with interstitial hardening agents.

28. The method of claim 1, wherein a metallurgical bond is formed between said assembly members.

29. A sputtering target assembly comprising:

an assembly member having a bonding side with a plurality of projections; and

an assembly member having a bonding side with a plurality of grooves, wherein said assembly member having said grooves is a metal having a melting point higher than that of the metal which comprises said projections, and wherein at least one groove is substantially filled by one projection via resistance heating of said at least one groove and said projection such that said assembly members are at least mechanically bonded together.

30. The sputtering target assembly of claim 29, wherein said assembly member having said grooves is a sputter target and said member having said projections is a backing plate.

31. The sputtering target assembly of claim 29, wherein said assembly member having said grooves is a backing plate and said member having said projections is a target.

32. The sputtering target assembly of claim 29, wherein a gap exists between a portion of said bonding sides.

33. The sputtering target assembly of claim 32, wherein a width of said gap is from about 0.001 inch to 0.1 inch.

34. The sputtering target assembly of claim 29, wherein a portion of said bonding sides are in contact.

35. The sputtering target assembly of claim 29, further comprising at least one cell member proximate to an interface defined by a portion of said bonding sides.

36. The sputtering target assembly of claim 35, wherein said cell member contains a gas at a pressure of from about 0.1 atmosphere to about 5 atmospheres.

37. The sputtering target assembly of claim 29, wherein said assembly member having said grooves comprises cobalt, titanium, copper, aluminum, tantalum, niobium, nickel, zirconium, hafnium, silver, gold or alloys thereof.

38. The sputtering target assembly of claim 29, wherein said assembly member

having said grooves comprises tantalum or alloys thereof.

39. The sputtering target assembly of claim 29, wherein said assembly member having said grooves comprises niobium or alloys thereof.

40. The sputtering target assembly of claim 29, wherein said assembly member having said projections comprises cobalt, titanium, copper, aluminum, tantalum, niobium, nickel, zirconium, hafnium, silver, gold, molybdenum or alloys thereof.

41. The sputtering target assembly of claim 29, wherein said assembly member having said projections comprises a copper-chromium or copper-zinc alloy.

42. The sputtering target assembly of claim 29, wherein said projections are of irregular shape.

43. The sputtering target assembly of claim 29, wherein said projections are substantially cylinders, cones, truncated cones, cubes, cuboids, pyramids, obelisks, or wedges, or combinations thereof.

44. The sputtering target assembly of claim 29, wherein said grooves are substantially in the shape of a square, rectangle, "T", "L", semicircle, truncated triangle, cusp, or a bowtie.

45. A method of joining metal members comprising:

contacting a portion of at least one projection on a bonding side of a first metal member having a plurality of projections against a portion of a groove on a bonding side of a second metal member having a plurality of grooves;

contacting a first electrode to one of said members, and a second electrode to the other of said members;

conducting an electric current through said electrodes to cause resistance heating of said at least one projection and said groove; and

partially deforming said at least one projection to a least partially fill said groove by applying a force between said at least one projection and said groove, thereby forming at least a mechanical bond between said members.

46. A method of forming a sputtering target assembly comprising resistance welding a sputter target to a backing plate.